NTSB National Transportation Safety Board

Office of Railroad, Pipeline & Hazardous Materials Investigations

Graniteville, SC

Hazardous Materials

Chlorine Release:

- Tank car punctured
- About 60 tons of poisonous liquefied chlorine gas released
- Ninth of 42 freight cars

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Chlorine Gas:

- Poisonous by inhalation
- Liquefied gas
- Vaporizes rapidly
- Volumetric expansion: 450 to 1
- Heavier than air

NTSB


CNIP


UTLX 902270
495573
CUSHIONING
FREIGHTMASTER
DO NOT GROUND TO
COUPLER WHEN WELDING
36 IN. WHEELS
SPRG 7 OC D5
SPRG 7 IC D6

Punctured Tank Car:

- Manufactured in 1993
- tested to 500 psig
  (¾ inch thick steel shell)
- Normalized steel
  - Improved fracture toughness
  - Lower ductile-to-brittle transition temperature
- One of the strongest tank cars in service

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Minot, North Dakota

Canadian Pacific Railway

January 18, 2002

- 5 tank cars catastrophically ruptured
- 147,000 gals anhydrous ammonia were instantaneously released
- 1 fatality and 11 serious injuries

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Minot Conclusion:

The low fracture toughness of the non-normalized steels used for the tank shells of the five tank cars that catastrophically failed in this accident contributed to the cars' complete fracture and separation.

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Minot Recommendations to FRA:

- Validate a predictive model that will quantify the dynamic forces acting on a tank car during an accident
- Develop and implement tank car design-specific fracture toughness standards for materials used to manufacture pressure tank cars

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Chlorine Gas Releases:

- 12 Fatalities
  - Graniteville, South Carolina (9)
  - Macdona, Texas (3)
- Large lethal clouds are generated within minutes
- Little time to alert citizens

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Reduction of Public Risk:

- Operational changes are needed to reduce the vulnerability of tank cars transporting poisonous by inhalation gases.

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Transportation Studies:

- The rear one-quarter of a train is the most desirable location for Haz Mat
- Reducing speed
- Reducing the length of trains

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